

RDX[®] Optimization for Data Reliability

Introduction

ProStor Systems RDX[®] Technology is a removable data cartridge optimized for high Data Reliability, cartridge robustness and long-term data storage. Designed for enterprise-class reliability, the RDX data cartridge houses a high-capacity mobile HDD in a rugged shock-proof mounting system.

This paper provides in-depth analysis of the failure mechanisms of the highest concern surrounding Data Reliability & Robustness using hard drive technology as the data medium. ProStor Systems developed RDX with Data Reliability & Cartridge Robustness at the forefront of our design considerations, making it ideal for applications requiring extended data life and high Reliability.

Definitions of Data Reliability, Archival Life & Robustness

The meanings of Data Reliability & Archival Life are often unclear in that they are used interchangeably and although related, they have distinct meanings. The standard definition of Reliability is; the probability that a system will perform its intended function for a specified time, under specified conditions. In this framework, Data Reliability is the probability of the data being uncorrupted and Archival Life is the specified time at which the Data Reliability is stated. For example a complete statement of Data Reliability would be: The Data Reliability is 99.99% for retrieval of 120GB of data when stored for 10 years at 30°C & 40% RH.

For the purposes of this paper robustness refers to the ability of the RDX system (bay and cartridge) to tolerate harsh conditions and hazards. (An example of is the use of a shock-proof mounting system to assure survival in the case of a cartridge being dropped during the normal course of usage.)

Reliability features for removable media

One of the unique challenges to the Reliability of removable media cartridge is the hazard of dropping onto a hard surface and surviving. It is common knowledge that hard drives are susceptible to shock events. In any realistic situation where a cartridge is dropped, the cartridge must provide adequate protection to the hard drive to ensure, with high likelihood, that it will work properly and allow the valuable data to be retrieved.

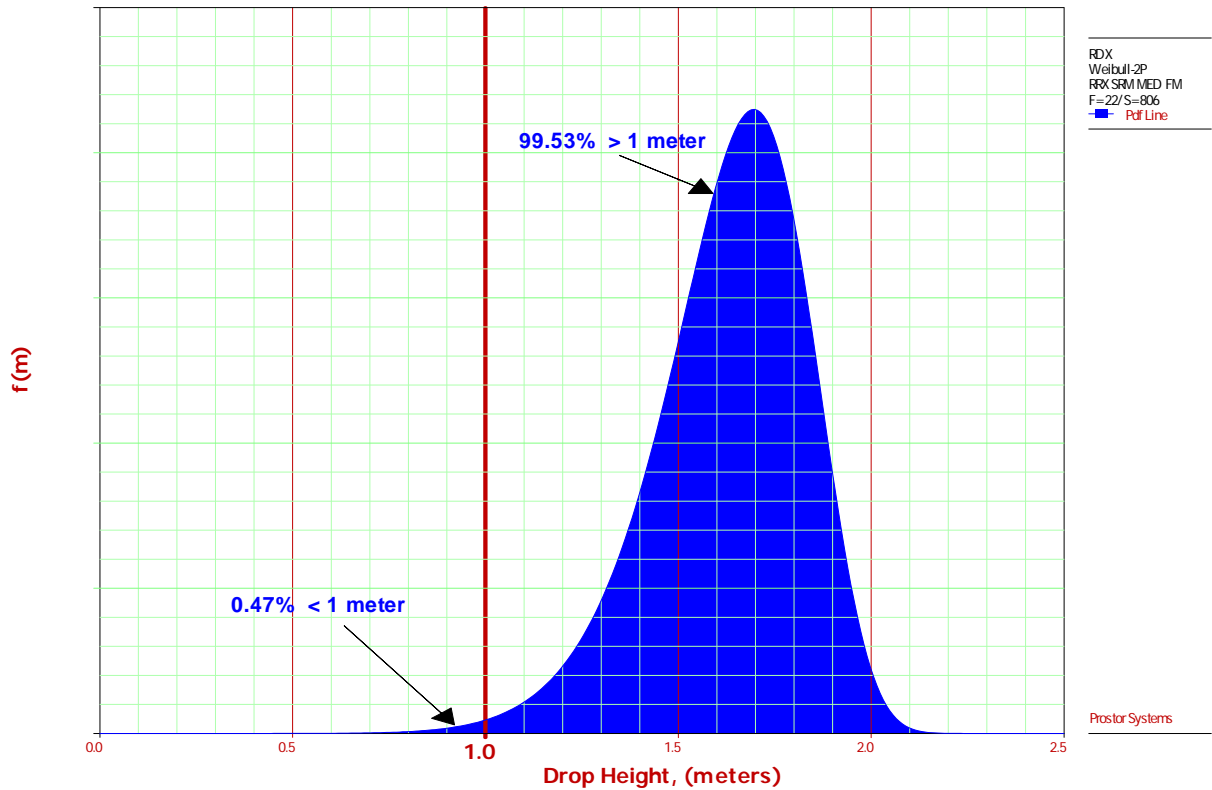
ProStor Systems has designed features into the RDX cartridge which provide significant protection in case it is dropped onto a hard surface. First the selection of the mobile drive which employs several rugged features, such as retracting the heads from the media so no damage occurs, high tolerance to shifting the disks on the motor and the use of a fluid dynamic bearing motor which is very tolerant to shock events. Secondly, the mobile hard drive is shock mounted with a unique combination of materials and geometry to reduce the level of shock seen by the hard drive during a drop event. Third, the selection of high strength plastics for the cartridge shell to preserve the mechanical integrity of the system.

ProStor Systems has exhaustive testing has been used to verify the effectiveness of the drop protection solution. The design goal was to survive a 1 meter drop onto concrete; as such ProStor chose this height as the starting point for drop testing. Cartridges were dropped from progressively higher levels many times. This test consisted of several hundred drops in multiple orientations, allowing the actual strength of the cartridge to be measured.

With greater than 99% survival rate at 1 meter (see graph A), ProStor believes that the RDX cartridge provides exceptional protection against the likelihood of most realistic drop events without loss of data reliability.

Graph A: Survival as a function of drop height

RDX Drop test Probability Function



Another unique challenge to the Reliability of removable media cartridge is the hazard of Electrostatic Discharge (ESD). Depending on environmental conditions, a person walking across a carpet can develop a triboelectric charge of several thousands of Volts. A discharge to a body of a different potential can cause immediate catastrophic failure or disruption of electronic equipment operation.

The ESD scenarios of concern for removable media cartridges are:

- Case#1: A charged operator or object contacting a stand alone cartridge this is a concern regarding the survival of the internal hard disk drive.
- Case#2: A charged operator or object contacting the installed cartridge while the device is operating. In this case discharges may result in performance degradation, damage or the disruption of operations.
- Case#3: A charged cartridge is inserted into the RDX drive bay, resulting in a discharge from hard disk drive to the electronics. This may result in drive failure or disruption of operation of the equipment.

Testing of case 1 & 2 are straight forward and defined by EN61000-4-2. However, ProStor developed a proprietary methodology to test Case#3

ProStor Systems has designed patent pending features into the RDX cartridge which provide protection for all cases of ESD events. ProStor believes that these features ensure that the RDX cartridge & drive bay provides exceptional protection against the likelihood of most realistic ESD events without loss of data reliability.

Data Reliability Benefits of RDX®

In applications where removable media is used for data protection, disaster recovery and long-term archival storage, RDX technology provides a robust solution with greatly increased data reliability over tape or native hard disk drive solutions:

- Ruggedized removable disk media cartridge capable of sustaining a drop
- ESD protection for your data cartridge and computer
- High tolerance to short term aberrations in storage and usage conditions
- Long archival “shelf-life” at enterprise level data reliabilities
- Data reliability that improves as future hard disk improvements occur in reliability